IV.4.1-ICP CALIBRATION SYSTEM INTERACTIVE CALIBRATION PROGRAM (ICP)

Introduction

The Interactive Calibration Program (ICP) is a graphical program used
to display data created by running the Manual Calibration Program
(MCP).

The user can check the effect of parameter values used, edit the
control deck and rerun MCP to test the new set of values.

The following topics are discussed in this Section:

   - Starting an ICP Run

   - Main Window Menu Bar
      A. Control Menu
          1. Select Watershed Button
          2. Relabel Button
          3. Run MCP Button
          4. Quit Button
      B. Edit Menu
          1. Edit Deck and Edit Selected Parameters Options
          2. Edit Wide List
          3. Edit Selected Parameters
          4. Editing The Curves
      C. Display Menu
          1. Water Year Plot Button

   - Water Year Plot Display
      A. Operation of the Water Year Plot Panes
      B. Scrolling the Data

   - The WY Plot Menu Bar
      A. Control Menu
          1. Panner
          2. Change Analysis Window
      B. Select Menu
          1. SAC-SMA
          2. SNOW-17
      C. Analysis Menu
          1. Percolation Analysis
              a. The PD Curve (Percolation Demand versus Lower Zone
                  Deficit Ratio)
              b. List of Active Curves
              c. Parameters
              d. Points

Starting an ICP Run

ICP uses three scripts to run MCP and to relabel the intermediate data
and the control files. To run ICP:

o cd to the directory where ICP is stored. This can be done using
   the environmental function go: go icp_rls
      or
   put the directory path where ICP and its three scripts are stored
   into the environmental PATH variable and
o run ICP: icp

The initial window contains the Main Window Menu Bar.

In the Main menu system different options are available at different
times. Options that are not available are greyed out to indicate they
are inactive.

Main Window Menu Bar

Main window menu bar has four buttons:

o Control
o Edit
o Display
o Help

The first three open pull-down menus with the following options:

Control	Edit	Display
Select Watershed	Edit Deck	WY-plot
Relabel	Edit Wide List	
Run MCP	Edit Selected Parameters	
Quit		

A. Control Menu

1. Select Watershed Button

   The first thing that must happen is a watershed is selected.
   Initially only the Control button and the Select Watershed
   buttons are active. Pressing the Control-Select Watershed
   buttons will open the Select Watershed window.

   The Select Watershed Window has two areas: the lower with control
   buttons and the upper with four panes. The first three of these
   panes are used to select a region-basin-watershed combination.
   The fourth pane is an informational pane showing which control
   decks are available.

   The panes are labeled:

       o Region
       o Basin
       o Watershed
       o Available Decks

   When the window is opened the Region pane is filled with a list
   of defined regions (as subdirectories of $(mcp_decks)/regions -

see Chapter I.2-UNIX-ICP). Clicking on a region displays in the Basin pane displays the basins defined for the selected region. Selecting a basin displays the watersheds which have been defined. The displayed names are the names of the subdirectories at each level. There is more about this under the Edit Menu, Edit Deck and Edit Selected Parameters Options.

The region-basin-watershed names are assigned by the user. The watersheds are usually named by their NWS Communications Handbook 5 identifier.

The notion of available decks is based on the ICP restriction that allows the user to maintain up to three decks for each watershed. These are for the current deck, the previous deck and for the best deck. Their file name suffixes are: .curr, .prev and .best.

After selecting Run MCP, Edit Deck, Edit Wide Listing or Edit Selected Parameters a file selection window is opened which lists the available files. For Edit Wide Listing this will open either an X/Motif Text Widget window or an editor window (if specified in the Apps_defaults token icp_editor - see Chapter I.2-UNIX-ICP) displaying the MCP hard copy output for that control deck suffix.

Selecting a watershed in the Selected Watersheds Window activates the Accept button and fills the Available Decks pane with the names of the available control decks.

The control buttons in the lower area of the Select Watershed window have the following actions:

- o   Accept registers the selected watershed as the one under consideration and closes the window
- o   the Cancel button cancels the current selections
- o   the Close button closes the window without registering a selection

The user can cancel any level of selection by selecting in the prior pane.

Once a watershed is Accepted all the buttons on the main menu bar become active.

2. Relabel Button

The control decks have the suffixes of .curr, .prev or .best. The output from MCP for use by ICP also have suffixes that match the output with the control deck. The Relabel function allows the user to move the files suffixed .curr to either .prev or .best or .prev to .best. This is for both the control deck and the graphics data and wide listing files. The Relabel function can be invoked directly from the Control pull down menu. It is also always available when editing a deck. If Relabeling is selected during an edit it will preserve the state of the .curr or .prev deck by renaming the appropriate files since the deck

that had been selected has already been read. If any value is
changed in the deck the changed deck is saved as the .curr
version.

3. Run MCP Button:

   When this option is selected a file selection window is opened
   which lists the decks available for the selected watershed. The
   MCP is run after:

      o a deck is selected and
      o Okay button is clicked

4. Quit Button:

   Selecting Quit will close all the windows, clear out all the
   MCP-ICP data communication files and exit ICP. The control decks
   with their changes are retained.

B. Edit Menu

1. Edit Deck and Edit Selected Parameters Options

   There are two buttons that invoke editing of control decks. They
   are Edit Decks and Edit Selected Parameters. Selecting either of
   these buttons opens a file selection window with the currently
   available decks. Selecting a deck and clicking on Okay opens
   another window that informs the user that at the end of editing
   the edited/changed deck will overwrite the .curr deck.

   The user is offered three options:

      o Overwrite
      o Cancel
      o Relabel

   Selecting Overwrite closes that window and opens the appropriate
   editing window. Edit Decks invokes either an X/Motif Text Widget
   window or an editor window (if specified in the .Apps_defaults
   token icp_editor - see Chapter I.2-UNIX-ICP) with the selected
   deck displayed. Edit Selected Parameters opens a menu with one
   button for each Operation for which there is an editor.

   Selecting Cancel stops the editing procedure and the window is
   closed.

   Selecting Relabel opens the Relabel function window.

   However a deck is selected for editing the saved deck is saved as
   the .curr version if there is any change in the values. If there
   is no change in values the deck is not written anywhere. To edit
   a .best version and institute it as the .curr version an actual
   change of values is needed. Changing 1.0 to 1.0 is not a change
   but 1.0 to 1.00 is a change.

When a deck is saved in the .curr version the name used is the
watershed as indicated by the directory name. If a user wants to
do some specialized testing and creates another directory and
then copies the base set of decks into the special directory the
name will change when a deck is edited and saved. For example:

```
copy
   .../wshz1/wshz1.curr     --> .../wshz1tst/wshz1.curr
           /wshz1.prev                      /wshz1.prev
           /wshz1.best                      /wshz1.best
edit
   .../wshz1tst/wshz1.curr  --> .../wshz1tst/wshz1tst.curr
              /wshz1.prev                      /wshz1.prev
              /wshz1.best                      /wshz1.best
```

Now there are four files in .../wshz1tst :
   wshz1.curr
   wshz1.prev
   wshz1.best
   wshz1tst.curr

All of these will appear when the File Selection window is opened
whether it is for editing Deck or Selected Parameters or running
MCP.

2. Edit Wide List

Until ICP can display all the MCP output in graphical form there
will be a file of the non-graphical display results. To view
them select Edit Wide List. The term comes from the wide (14-
inch) paper the MCP output was printed on to display the
discharge and other time series. This selection opens either an
X/Motif Text Widget window or an editor window (if specified in
the .Apps_defaults token icp_editor - see Chapter I.2-UNIX-ICP)
with the output displayed.

3. Edit Selected Parameters

Clicking this button opens a pull-down menu allowing editing of
selected parameters for Operations SAC-SMA, SNOW-17 and UNIT-HG.

Operations SAC-SMA and SNOW-17 have both scalar parameters and
parameters represented as curves. Operation UNIT-HG has only
parameters represented as a curve.

a. Operations SAC-SMA and SNOW-17

The panel has a column of labels and a column of parameter
values for each of Operation Names. The label column contains
the parameter name. The succeeding columns are contain the
parameter values. The last button on each column is labeled
CURVE. Selecting one of these buttons opens the graphical
editor for the ET-Demand/PE-Adjust curves in Operation SAC-SMA
and the AESC curve in Operation SNOW-17.

Parameter values are changed by highlighting the numbers to be changed and changing them. When the cursor is moved out the text editing window the number is range checked. If it is out of range the original value is restored and a Warning Box window is opened which specifies the range limit.

If there is more than one Operation Name the consistency among the values of a given parameter is maintained. Some parameters are maintained by increment (i.e. if x is added to/subtracted from the value in one Operation Name) it is added to/subtracted from the same value in the other Operation Name. Other parameters are maintained by ratio. Some parameters are not adjusted at all. This feature can be turned off or on by pressing the toggle button labeled Preserve Ratio/Diff at the lower right hand corner of the panel.

The Okay button will save these values to the deck, writing the deck to a file and close the editing session.

The Cancel button will close the editing session and ignore any changes made to these parameters. If the CURVE editing feature has been selected and the values of that editing are saved then Canceling with this button will not change those saved values.

b. Operations SAC-SMA, SNOW-17 and UNIT-HG

The button labeled Curve will open the graphical and text editing feature for data best represented by a curve as follows:

    o SAC-SMA - ET-Demand or PE-Adjust depending on what is
                    present
    o SNOW-17 - AESC
    o UNIT-HG - the Unit Hydrograph

4. Editing The Curves

Two windows are opened when the Curve editing feature is selected: one in which the curve is displayed for graphical editing and one in which the curve values are set into text boxes for text editing.

The text editing window has two columns and a panel at the bottom. The left column contains labels identifying the x-values of the curve and the right column contains the corresponding y-value in a text editor. This text editor operates slightly differently from the one described above for scalar parameter editing. The difference is that the changes are read if the Enter key is pressed as well as moving the cursor out the text box window.

The panel at the bottom of the text editing window has four buttons:

o Save & Close   - the data are saved and the editing
                                session closed
        o Cancel & Close   - the data are not saved and the editing
                                session closed
        o Reset Last Change - undo last change
        o Restore Original - reset all values to beginning value

   The graph window has a menu bar with one button labeled Control.
   When this button is selected a Pull-Down-Tear-Off menu is opened
   that has the same four buttons as at the bottom of the textual
   editing window.

   The graphical editing is done by putting the cursor closer to the
   point to be changed than to any other point, pressing and holding
   the left mouse button and moving the cursor until the desired
   position is located and then releasing the button. When the left
   mouse button is pressed, ICP will move the cursor onto the point
   closest to it, which is thereby selected. When the point is
   moved by holding the button down and moving the cursor, the
   values are also changed in the textual editing window. Note that
   as x-values cannot be changed, movement is allowed only
   vertically. The curve lines are re-drawn as the cursor moves the
   point.

   The PE-Demand/ET-Adjust is an annual cycle with the values being
   for the 16th of the month. January 16 is plotted as both the
   right-most and left-most ordinate.

   The AESC curve has fixed values for the end points: 0.05 at
   WE/A(0) and 1.00 at WE/A(1). Therefore these points cannot be
   selected.

   The Unit Hydrograph is edited similarly as in the Interactive
   Forecast Program (IFP):

     o When a point is changed then all the points are readjusted
        so their sum is the same as original sum.
     o When an adjusted point is to the right of the last adjusted
        point, the points are joined by a linear interpolation. This
        is to facilitate the zeroing out to the end of the curve.

C. Display Menu

   Clicking the Display button opens a menu which has a button for each
   of the available display options. The one currently available is
   for the Water Year Plot. It is the only button currently available.

     a. Water Year Plot Button

        The Water Year plot becomes available after an MCP run has
        been made. Selecting the Water Year (WY) Plot opens a menu
        which has three selections. These selections indicate for
        which of the control decks of this watershed there is
        graphical display data. The watershed is known by its
        directory name and the suffix for which the possibilities are

limited to .curr, .prev and .best. The control decks for
which there is display data have active selection buttons and
the others are inactive and greyed out. Selecting one of the
active deck buttons opens a window in which the Water Year
Plot is displayed.

Water Year Plot Display

The Water Year Plot display has two fully adjustable panes:

   o one for displaying the discharge time series output from the
      WY-Plot Operation
   o one to display the output time series from other Operations which
      area currently SAC-SMA and SNOW-17

There is one marginally adjustable pane at the top for the menu bar.

A. Operation of the Water Year Plot Panes

   The panes are adjusted by placing the mouse arrow over the small
   button at the right hand end of the pane separator (the arrow will
   change to a cross-hair), press and hold the left button, adjust the
   pane to the desired size and release the button.

   When the WY Plot window opens, the output from the WY-PLOT Operation
   is displayed automatically. This is displayed in the lower pane
   which is divided into two adjustable panes:

      o one for the rain+melt
      o the other, all the discharge time series output in the WY-PLOT
         Operation along with a horizontal scale, a horizontal slide
         bar and a Log/Arithmetic display toggle button

   The upper pane comes up with the message that 'No Models Have Been
   Selected'.

   Putting the cursor (arrow) on either vertical scale in the WY Plot
   window and clicking either the right or the left button will display
   a window with a legend for the discharge time series.

B. Scrolling the Data

   Scrolling the data can be done by four methods in the WY Plot window
   and associated scroll bar and by one method in the Panner:

   o WY Plot window and horizontal scroll bar:

      - clicking on the arrow heads on the end of the scroll bar
         scrolls the data one observation point (usually a day)
      - clicking in the scroll bar area on either side of the slider
         scrolls the data one scroll width (see 'Change Analysis
         Window')
         'grabbing' the slider by putting the arrow cursor on the
         slider and pressing and holding the left mouse button and

'pulling' the slider through the trough scrolls the data as
much as the slider is repositioned
- 'grabbing' (putting the cursor into the pane and pressing and
holding the left button) inside the discharge time series
display (the cursor becomes a hand) and 'pulling' the display
scrolls the data as much as the display is 'pulled'

o Panner:

- doing step 4 above in the Panner window

WY Plot Menu Bar

There are currently four buttons on the WY Plot Menu Bar:

o Control
o Select
o Analysis
o Help

The first three open pull down menus with the following options:

Control	Select	Analysis
Panner	Snow17	Percolation
Change Analysis Window	No Models	
Quit	SAC-SMA	
	Water Year	

A. Control Menu

1. Panner

   Selecting the Panner button opens a window in the lower right
   hand corner of the screen in which the observed discharge time
   series (QME) for the entire period of record is displayed. The
   portion of the QME which is displayed in the WY Plot window is
   bounded by four yellow lines. The data can be scrolled in the
   Panner window as described above, under Scrolling The Data.
   Regardless how the data display is scrolled, the yellow lines
   follow and always indicate what data are displayed in the WY
   Plot window and where it is in the period of record.

2. Change Analysis Window

   Selecting the Change Analysis Window opens a window with which
   the user can adjust the number of observations displayed in the
   WY Plot window (duration) and the maximum and the minimum values
   displayed. The duration can extend from 1 to all. The yellow
   lines in the Panner are generally visible down to a duration of
   12-15 days. This limit can be relaxed by stretching the Panner
   window wider. The discharge time series cannot display less
   than two points. The SAC-SMA can display 1 point. Changing the
   maximum and minimum values can act as a microscope on the data.
   Data values outside the maximum-minimum range are not plotted in

the WY Plot. These values are indicated by the top and bottom
yellow lines in the Panner.

There are three buttons at the bottom of the window:

    o Okay
    o Apply
    o Close

Apply applies the values present in the three selectors.

Okay is the same as Apply plus it closes the Change Analysis
Window.

Close closes the Change Analysis Window without changing any
values.

B. Select Menu

The Select menu offers the user display options. Of the four
buttons available (Water Year, SAC-SMA and SNOW-17 and No Models)
only the first three display data. The 'No Models' selection is
provided to the user as it is the opening default presentation.

Each of the SAC-SMA, SNOW-17 and Water Year buttons opens a pull
down menu which will offer the Operations (forecast points) prepared
by the user.

1. SAC-SMA

The SAC-SMA button brings up a display with three or four
adjustable panes:
    o Frost Index (if present)
    o Rain+Melt
    o Runoff by component
    o the five SAC-SMA bucket values (UZTWD, LZTWD, UZFWC,
       LZFWC and LZPWC)

The Frost Index time series pane is displayed only if the
variable FGIX is present. When it is present it is a descending
black line from freezing (zero degrees) downward.

The Rain+Melt pane displays two time series: PXV as Rain+Melt
and TCI as Total Runoff. PXV is plotted as a descending magenta
bar and TCI as a descending blue line.

In the next pane the six runoff components (SURface, DIRect,
IMPervious, INTerFlow, SUPplemental and PRImary) are displayed
as a color banded column with each component's size representing
its percent of total runoff. The color legend is to the left in
the display.

In the last pane the five SAC-SMA 'buckets' (UZTWD, LZTWD,
UZFWC, LZFWC and LZPWC) are displayed as bar charts, with the
size relative to the capacity of the bucket. The actual

capacities are displayed in the legend at the left of the
drawing areas. All of the values, both contents and deficits,
are drawn as bar charts from the bottom as though a 'bucket' is
being filled. The deficits are drawn in shades of cyan; the
contents are drawn in blue. The display represents conditions
at the end of each day.

2. SNOW-17

The SNOW-17 button brings up a display with four adjustable
panels:

    o   Rain/Snow Elevation with Precipitation
    o   Energy Exchange with Air Temp, TINDEX and snow
        temperature
    o   Liquid Water with Rain+Melt on bare ground and snow pack
        and Negative Heat Storage
    o   Water Equivalent, Areal Extent of Snow Cover, simulated
        snow depth and observed snow depth

The Rain/Snow Elevation panel displays the RSE time series as a
line and the PRECIP time series as descending blue bars for rain
and white bars for snow.

The Energy Exchange panel displays PQNET as red bars rising from
the middle of the panel, the air temp as a blue line and TINDEX
as a green line. TINDEX has nil value at air temps at or above
freezing. Snow temperature is plotted as a black line in units
of DEGC.

The Liquid Water fraction is shown as a blue line descending
from zero at the middle of the panel; Negative Heat Storage, the
NEGHS time series, as an orange line, also descending from the
middle of the panel; Rain+Melt, the RAIM time series, as bar
rising from the middle of the panel, magenta for the bare ground
and blue for on snow pack.

The Water Equivalent panel displays the WEQ time series as a
rising blue line and AESC a descending orange line in units of
MM. They track counter to each other. Simulated snow depth in
magenta is plotted with observed snow depth in green in units of
CM.

C. Analysis Menu

The Analysis button opens a pull down menu. There is currently only
one selection:

o   Percolation

   The Percolation Analysis allows the users to click on a point in
   the Water Year Plot and have its Lower Zone Deficit Ratio
   (LZDEFR) computed and marked on the Percolation Demand curve.
   As the point is presumably selected on the basis of the various
   Soil Moisture Zone contents, Percolation analysis can not be

done if the SAC-SMA display is not open. If this is attempted a
warning window is opened with the same message and the analysis
is prevented.

The Percolation Analysis will not modify the control deck. It
is the users responsibility to modify the control deck through
one of the editing mechanisms available.

Also there is maximum of 15 active curves. Except for the base
curve curves can be deleted. Uninteresting curves should be
deleted.

Selecting Percolation from the Analysis pull down menu opens a
file selection window. The users selects a control deck and
clicks on OK.

There are four windows in the Percolation Analysis:

> o   the Percolation Demand (PD) versus Lower Zone Deficit
>   Ratio (LZDEFR) curve
> o   list of the currently being tested curves identified in
>   the list by parameter values but cross referenced into
>   the curve by number and color
> o   feature of building test curves by indicating points on
>   the PD curve and requesting a least-squares fit if
>   desired
> o   calibrating test curves by adjusting one of four
>   parameters REXP, ZPERC, LZFSM and LZFPM

The PD curve and List of Curves windows open immediately; the
other two are selected by the user from the Select button on the
PD curve menu bar.

> a. The PD Curve (Percolation Demand versus Lower Zone
>   Deficit Ratio).
>
>   The PD curve displays the LZDEFR with descending values
>   to the right. Thus the curves start with the maximum PD
>   [f(ZPERC)] in the upper left hand corner at LZDEFR=1.0
>   and descends to the minimum PD value [PBASE] at the lower
>   right hand corner. The PD scale goes to 0.00. PBASE is
>   shown on the curve as horizontal dashed line with its
>   value indicated on the PD scale, specifically (see
>   Parameters for notes on changing PBASE).
>
>   The curves are drawn in black with a colored symbol at
>   each value of LZDEFR. The symbol is the number of the
>   curve as indicated in the List window. The color is the
>   same used for the information in the List.
>
>   The first curve is drawn based on the data in the control
>   deck. It is number 1 and cannot be removed from the
>   window.
>
>   Finally if the cursor in placed in the water year plot

hydrograph it is changed from an arrow to a cross hair.
If the mouse is clicked the Soil Moisture Zone Contents
for that day are used to compute the LZDEFR for that day.
This is marked in the PD curve with a vertical dashed
line.

To move the vertical line, move the cursor to another day
and click the mouse. To remove the line, click the mouse
again or move the cursor and double click the mouse.

The menu bar of the PD Curve has three buttons:

    o Control
    o Select
    o Help

The first two open pull down menus.

    <u>Control</u>   <u>Select</u>
    Quit   Parameters
              Points

The Control pull down has one button:

    o Quit

The Quit button closes all the open windows in the
Percolation Analysis.

The Select pull down has two buttons:

    o Parameters
    o Points

Selecting Parameters opens a window in which the four
parameters ZPERC, REXP, LZFSM and LZFPM can be modified.

Selecting Points opens a pull down-tearoff menu through
which points can be selected on the PD curve display and
a least squares fit drawn through them and outlying
values from the first curve drawn to the right of the
last selected point.

b. List of Active Curves

This display indicates the values of the pertinent
parameters for each curve: ZPERC, REXP, LXFSM and, LZFPM.
Each curve is numbered and all its values are in a color.
This number and color are used as the symbol for this
curve in the PD Curve display.

The top row is a series of labels that identify the
columns of values, plus a button labeled
'ReNumber/Color'. This ReNumber/Color button allows the
user to do just that. If the user has deleted some

curves, for any reason, such as the analysis has reached the maximum of 15 active curves or some of the curves have been deleted then clicking on the ReNumber/Color button will renumber and recolor the curves.

Below the ReNumber/Color button and beside each curve description are two buttons:

- o a toggle labeled 'Show'
- o a push button labeled 'Delete'

The Show button will turn off/on the curve display in the PD Curve window.

The Delete curve will remove the curve from analysis completely. Curve Number 1, the one based on the data in the control deck, cannot be Deleted from the analysis.

c. Parameters

Selecting the Parameters button from the Select pull down menu opens a window with two panels.

The upper panel has four pairs of labels and text boxes. These are for the four adjustable variables: ZPERC, REXP, LZFSM and LZFPM. Changing either LZFSM or LZFPM will change PBASE. Deleting any curve whose construction changed PBASE will not restore PBASE to a previous value.

The lower panel has two buttons:

- o compute - computes a new PBASE, if necessary; computes a new PD/LZDEFR curve and displays it and lists it in the List window
- o close   - closes the Parameter Adjust window

d. Points

Selecting the Points button from the Select pull down menu opens a tear off menu with three buttons:

- o Build   - clicking on the PD curve window marks points
- o Solve   - computes least squares fit using the points marked in the Build process and all the points from the first curve to the right of the rightmost point marked in the Build process
- o Clear Points - unmark all points marked in the Build process

The curve computed via the Solve button is displayed in the PD curve window and listed in the List window.

The Solve button is not active unless points have been initially marked or new ones have been marked since the last Solve.

Points can be individually removed by putting the cursor on the point and clicking on them.

If a point is selected below PBASE a warning window opens suggesting not to Solve this. A user may want to put a point there and then use the Parameter method to adjust PBASE, etc..